

# Full authority digital engine controls (FADEC) overhaul

## Maintaining excellence

### The importance of a FADEC overhaul

BAE Systems, through FADEC International, develops, manufactures and supports high reliability aircraft electronic products for harsh engine environments. The company serves airlines and aircraft maintenance and repair providers with a full range of aftermarket capabilities including maintenance, repair and overhaul of full authority digital electronic controls (FADECs) for commercial aircraft engine.

### A brief history

Full authority digital engine controls (FADECs) are mounted on the side of the aircraft engine and are specifically designed to operate in a harsh environments (i.e. temperature, vibration, EMI, engine wash, etc.). These controls must be reliable to ensure full utilization of the aircraft – often 10-12 hours every day.

FADECs first entered into service in 1987. They are categorized as “on condition” equipment which means they are removed only when a failure is indicated. However, as they age, the failure rates gradually increase due to stresses brought on by the various harsh environments.

### Addressing a concern

In the early 2000s, product support personnel began to engage with airlines as to how we could support FADECs over the long term. As we closely monitored field reliability of these controls, we discovered trends indicating that failure rates related to operating hours and cycles in older units were gradually increasing. This issue was never an issue of safety – due to the redundancies built into the control system – but one of aircraft downtime and higher maintenance costs to airlines.



### The benefit of an overhaul

Airlines are no stranger to the concept of periodic overhaul of mechanical systems, components, and parts. As such, they wanted to know if there was a way to institute an overhaul program to improve the reliability of aging FADECs. A team was formed to address this question and two conclusions were reached:

- Failure trends were real and in many cases could be corrected proactively (before the failure actually occurred)
- Overhauling FADECs would offer a cost-effective way for airlines to ensure the integrity and lifespan of older FADECs

Using extensive field data, coupled with input from operators, the team devised a FADEC overhaul plan. Airlines provided feedback that suggested they immediately saw the benefit of a proactive FADEC maintenance and overhaul plan.

## Key features and benefits

- This robust FADEC overhaul process has been developed based upon extensive knowledge of severe engine environments, FADEC design attributes and repair history
- Providing proactive repair to potential failures associated with high flight hours and/or severe environment lowers overall maintenance costs and extends the serviceable life of the FADEC in the field
- Offering the flexibility to provide FADEC overhaul services during scheduled engine shop visits, minimizing potential delays and cancellations for airlines and passengers
- Provides an extended warranty
- FADEC overhaul is endorsed by the engine manufacturers and the procedure is released in a service bulletin

| ENGINE    | OVERHAUL | SERVICE BULLETIN  |
|-----------|----------|-------------------|
| CFM56-5A  | FADEC 1  | 73-0220 / 73-0223 |
| CF6-80C2  | FADEC 1  | 73-0426 / 73-0430 |
| CFM56-5C  | FADEC 2  | 73-0204           |
| CFM56-7B  | FADEC 2  | 73-0216           |
| GE90-94B  | FADEC 3  | 73-0132           |
| GE90-115B | FADEC 3  | 73-0105           |

More than 3,500 overhauls performed

## The FADEC overhaul process



**Review** unit historic data



**Perform** non-volatile memory retrieval



**Perform** incoming testing



**Complete** unit configuration load sheet



**Service** bulletin status



**Perform** subassembly testing



**Perform** visual inspection



**Perform** service bulletins, repair and install subassemblies



**Reassemble** unit with new process items



**Perform** outgoing testing



**Return** to service as overhauled

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